1.3. SAMOA OBSERVATORY

J. MICHALSKI, M. GAYLORD, AND E. SANDBERG

1.3.1. OPERATIONS

American Samoa is located in the middle of the South Pacific Ocean, about midway between Hawaii and New Zealand. The island is characterized by year-round warmth and humidity, lush green mountains, and the strong Samoan culture. Many changes occurred at the American Samoa Observatory (SMO) during 2000-2001.

During the first half of 2000 the entire station was cleaned and organized. Truckloads of trash, including broken instruments, out-of-date spare parts and manuals, 7000 pounds of leaking lead acid batteries, and a cabinet full of mostly unidentified, corroding hazardous materials, were hauled to the appropriate disposal areas. Both the batteries and hazardous materials were disposed of by the local Environmental Protection Agency (EPA) office.

Data collection was made more reliable with the institution of weekly File Transfer Protocol (FTP) data transfers and weekly data backups. New daily check sheets, modeled after those at Barrow and South Pole, were created for all instruments.

Basic station maintenance was completed, including painting the new Dobson dome, and painting and weatherproofing the roof, which fixed the leaks. A new wood crown on the parapet was installed and painted. New window glass replaced the old, yellowing Plexiglas in the main laboratory. The old meteorological scaffolding tower was dismantled and removed.

Improvements in air sampling were made with the movement of all instruments previously on the old scaffolding tower to the new Blue Sky mobile phone tower. The new tower provides higher sample positions for the CMDL Halocarbon and other Atmospheric Trace Species (HATS) group and Advanced Global Atmospheric Gases Experiment (AGAGE) gas chromatograph (GC) intakes, and better positions for the meteorological wind and temperature sensors. The Miami Sea-Air Exchange Experiment South Pacific Aerosol Network (SEASPAN) filter apparatus also was relocated to the top of the new tower. All data and power cables were protected inside conduit connecting the Hudson building to the top of the tower.

To further complete the scientific improvements, all computers were networked with modern 10 base-T cabling, and a data link between the Hudson building and the main laboratory was installed. All computers can now share and copy files, making it much easier to back up data throughout the laboratory.

During 2001 facilities were significantly improved with the completion of some major projects. The old, rotting carport was demolished and replaced with a new, three-stall port. The new carport has the dual purpose of shading parked cars and supporting the rehabilitated solar photovoltaic (PV) array. The PV array, which was dormant for the last decade, was rehabilitated with a grant from the U.S. Department of Energy (DOE) through the American Samoa Government's Territorial Energy Office (TEO), a local agency supporting island-wide energy conservation and alternative energy sources. With the help of people at TEO and the local Community College, all the solar panels were refurbished and a grid-tied inverter was installed, which puts the solar power directly into the station's main breaker panel. The solar-electric power supplements the electricity demand whenever the Sun is shining and can provide up to 30% of daytime electricity demand. Along with the new carport and solar project, the old and disintegrating cedar shake on the station awning was replaced with corrugated roofing material, matched to the color of the new carport.

The last link for state-of-the-art scientific data collection at SMO is a real-time connection to the Internet. During 2001 significant progress was made in developing an agree-ment with the Pan-Pacific Education and Communication Experiments by Satellite (PEACESAT) program to connect to its island-wide Internet education network. The agreement has been finalized and only needs to be signed and enacted. It is realistic to plan on real-time Internet service to the laboratory by the end of the second quarter of 2002.

Finally, the chief's and technician's houses were completely gutted and remodeled. The chief's house was remodeled by island contractors, supervised by the Army Corps of Engineers. The technician's house was re-modeled by the technician, and a new kitchen, bath, laundry, utility, bedroom, computer room, and living room were added. Two new trucks, Ford Rangers with extended cabs, were acquired for observatory operations. The old Toyota and Mitsubishi trucks were sold in a government auction. The new houses and station vehicles will make for a much more enjoyable lifestyle for employees working at SMO.

For the near future, areas that need immediate attention include replacement of the stairs down to the point and rehabilitation of the underside of the observatory roof where the concrete is severely flaking off.

1.3.2. PROGRAMS

Table 1.3 summarizes the programs at SMO for 2000-2001. Operational highlights follow:

Gases

Carbon dioxide. In situ monitoring and AIRKIT sampling continued without interruption during this reporting period.

Surface ozone. In situ monitoring with the Thermo Environmental Instruments (TEI) ultraviolet (UV) photo-metric ozone analyzer continued uninterrupted throughout the reporting period.

Total ozone. The Dobson spectrophotometer continued to operate reliably during 2000-2001. In October 2001 it was sent to Christchurch, New Zealand, for an intercomparison and calibration.

Ozonesonde balloons. Weekly ozonesonde flights continued during this reporting period with the National Weather Service (NWS) balloon inflation facility at the Tafuna airport.

Halocarbons and other atmospheric trace species. The Chromatograph for Atmospheric Trace Species (CATS) operated throughout this reporting period, and the Radiatively Important Trace Species (RITS) system was retired on September 29, 2000.

Aerosols

The only aerosol-measuring instrument at Samoa is a Pollak condensation nucleus counter (CNC). Daily Pollak observations were conducted in 2000-2001, although a significant valve leak prevented observations in late 2001, pending arrival of replacement parts.

Solar Radiation and Meteorology

The solar radiation and meteorological instruments continued to operate throughout the reporting period. In early 2000 the meteorological instruments were repositioned on the new mobile phone tower after the old meteorology scaffolding tower was removed.

Cooperative Programs

A complete list of SMO cooperative projects is given in Table 1.3. All operated without significant problems during 2000-2001. One new project was added in May 2001, the U.S. Geological Survey (USGS) Evapotranspiration Study, which is designed to measure the combined loss of water from the Earth via evaporation and transpiration. For this program a small monitoring station was set up on the grounds of the observatory and will remain there until May 2002.

TABLE 1.3. Summary of Measurement Programs at SMO in 2000-2001

Program/Measurement	Instrument	Sampling Frequency
Gases		
CO_2	Siemens Ultramat-5E analyzer	Continuous
CO_2, CH_4	0.5-L glass flasks, through analyzer	1 pair wk^{-1}
CO_2, CH_4, CO, and ^{13}C, ^{18}O of CO_2	2.5-L glass flasks, AIRKIT	1 pair wk^{-1}
Surface O_3	TEI UV photometric ozone analyzer	Continuous
Total O_3	Dobson spectrophotometer no. 42	4 day^{-1}
O_3 profiles	Balloonborne ECC sonde	1 wk^{-1}
N_2O, CFC-11, CFC-12, CFC-113, CH_3CCl_3, CCl_4, SF_6, HCFC-22, HCFC-141b, HCFC-142b, HCFC-21, HCFC-124, HFC-134a, HFC-152a, CH_3Br, CH_3Cl, CH_3I, CH_2Cl_2, $CHCl_3$, C_2Cl_4, H-1301, H-1211, $CHBr_3$, CH_2Br_2, C_6H_6, COS	2.5-L glass flasks, AIRKIT	2 pairs mo^{-1}
	850-mL, 2.5-L, or 3.0-L stainless-steel flasks	1 pair wk^{-1}
CFC-11, CFC-12, CFC-113, N_2O, CCl_4, H-1211, CH_3CCl_3, SF_6, HCFC-22, CH_3Cl, CH_3Br, COS, HCFC-142b, $CHCl_3$	CATS four-channel automated GC	1 sample h^{-1}
N_2O	Shimadzu automated GC (ended 9/00)	1 sample h^{-1}
Aerosols		
Condensation nuclei	Pollak CNC	1 day^{-1}
Solar Radiation		
Global irradiance	Eppley pyranometers with Q and RG8 filters	Continuous
Direct irradiance	Eppley pyrheliometer with Q filter	Continuous
	Eppley pyrheliometer with Q, OG1, RG2, and RG8 filters	Discrete
Diffuse irradiance	Eppley pyranometers with shading disk and Q filter	Continuous
Terrestrial (IR) Radiation		
Downwelling	Eppley pyrgeometer	Continuous
Meteorology		
Air temperature	Thermistors (3)	Continuous
Dewpoint temperature	Polished mirror	Continuous
Pressure	Capacitance transducer	Continuous
	Mercurial barometer	1 wk^{-1}
Wind (speed and direction)	R.M. Young Windbird	Continuous
Precipitation	Rain gauge, tipping bucket	Continuous
	Rain gauge, plastic bulk	1 day^{-1}
Cooperative Programs		
CO_2, ^{13}C, N_2O (SIO)	5-L evacuated glass flasks	1 trio wk^{-1}
CO_2, O_2, N_2 (SIO)	5-L glass flasks	2 trios mo^{-1}
CH_4, N_2O, $CHCl_3$, CFC-11, CFC-12, CFC-113, CCl_4, CH_3CCl_3 (NASA-AGAGE)	HP5890 Series II 3 channel gas chromatograph	3 h^{-1}
Total suspended particulates (DOE)	High-volume filter sampler	Continuous (1 filter wk^{-1})
Total suspended particulates (SEASPAN)	High-volume filter sampler	Continuous (1 filter wk^{-1})
Light hydrocarbons (Univ. of California, Irvine)	1-L evacuated stainless steel flasks	3-4 flasks qtr^{-1}
O_2 (Princeton Univ.)	2.5-L glass flasks	1 pair wk^{-1}
H_2O budget (USGS, Samoa EPA)	Evapotranspiration pan	Continuous

SIO, Scripps Institution of Oceanography.